BESCAPE – Boosting Europe's Space Competitiveness through Advanced Power Electronics

BESCAPE training and research program is a unique initiative in the field of Power Electronics, designed to address the emerging technological challenges in human space exploration. Developed in close collaboration with the European Space Agency (ESA) and leading European space companies, the program focuses on identifying and advancing power conversion and distribution technologies essential for the next generation of spacecraft. BESCAPE aims to enhance European competitiveness, workforce, and autonomy in space exploration through cutting-edge Power Electronics R&D. The key scientific challenges, identified by major European space stakeholders, include the following research areas:

- Proposed innovative DC Micro Grids architectures for the future space missions
- Development of power converters to support AI processors in communication satellites
- Design of circuits for high secondary bus voltages and optimization of compact high-frequency transformers in high-power spacecraft
- Innovation in digital control techniques to improve the performance and reliability of power converters
- Integration of Wireless Power Transfer technology to meet emerging needs in space
- Design and optimization of GaN integrated circuit building blocks for power electronics
- Development of prognosis and health monitoring techniques for DC/DC converters using machine learning
- Advancement of novel DC power distribution protection, such as Latching Current Limiters and Solid-State Circuit Breakers, based on SiC JFET devices and composite arrangements

BESCAPE is not only committed to train the next generation of European scientists in space power electronics but also focuses on advancing innovative technologies for spacecraft. The knowledge and workforce trained through the program will be transferred to the desperate in need space sector, including companies, ESA, and academic institutions, to strengthen Europe's competitiveness in space exploration.

Coordinator: Universidad Politecnica de Madrid

Beneficiary: Università di Padova

UNIPD Supervisor: Simone Buso

Department: Department of Information Engineering

Total Contribution: € 4 130 659,28

Project Duration in months: 48

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